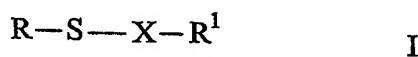


Claims

1. A method of forming a disulfide bond, the method comprising reacting an
5 organic compound comprising at least one thiol group with a compound of formula
I:



10 wherein:
X denotes SO_2 or Se ;
R denotes an organic moiety; and
15 R^1 denotes an optionally substituted alkyl group, an optionally substituted phenyl group, an optionally substituted pyridyl group or an optionally substituted naphthyl group;
with the proviso that when X denotes SO_2 then R^1 does not denote optionally substituted alkyl.

2. A method according to claim 1, wherein the organic compound comprising
20 at least one thiol group is an amino acid, a peptide or a protein.

3. A method of chemically modifying a protein, peptide or amino acid comprising at least one thiol group, the method comprising reacting said protein, peptide or amino acid with a compound of formula I:

25
$$R-S-X-R^1 \quad I$$

wherein:
X denotes SO_2 or Se ;
30 R denotes an organic moiety; and
 R^1 denotes an optionally substituted alkyl group, an optionally substituted phenyl group, an optionally substituted pyridyl group or an optionally substituted naphthyl group;

with the proviso that when X denotes SO_2 then R^1 does not denote optionally substituted alkyl.

4. A method according to any one of claims 1 to 3, wherein R is a carbohydrate group.

5. A method according to any one of claims 1 to 4, wherein R^1 is phenyl.

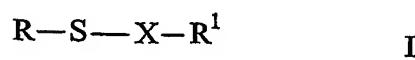
6. A method according to any one of claims 1 to 5, wherein X is Se.

10

7. A method according to any one of claims 1 to 5, wherein X is SO_2 .

8. A compound of formula I:

15



wherein:

X denotes SO_2 or Se;

R denotes a carbohydrate moiety; and

20

R^1 denotes an optionally substituted alkyl group, an optionally substituted phenyl group, optionally substituted pyridyl group or an optionally substituted naphthyl group;

with the proviso that when X denotes SO_2 , then R^1 does not denote optionally substituted alkyl.

25

9. A compound according to claim 8 wherein R^1 is phenyl.

10. A compound according to claim 8 or claim 9, wherein X is Se.

30

11. A compound according to claim 8 or claim 9, wherein X is SO_2 .

12. A method for preparing a compound of formula I as defined in claim 11, said method comprising reacting a compound of formula II:



wherein:

5 M denotes a metal, for example Li, Na, K, Ca, Cs, Zn, Mg, or Al; and
k denotes 1, 2 or 3;

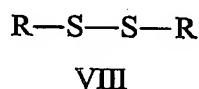
with a compound of formula III:



wherein:

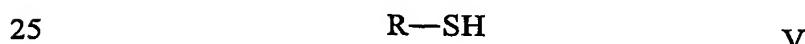
L denotes a leaving group.

15 13. A method for preparing a compound of formula I as defined in claim 11, said method comprising reacting a disulfide compound of formula VIII:

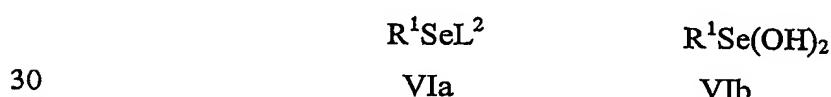


20 with a sulfinite anion of formula $R^1SO_2^-$ in the presence of silver ions.

14. A method for preparing a compound of formula I as defined in claim 10, said method comprising reacting a compound of formula V:



with a compound of formula VIa or VIb:



wherein L^2 denotes Br, Cl, CN, or I.

15. Use of a compound of formula I as defined in any of claims 1 to 7, in disulphide bond formation.

5 16. Use of a compound of formula I as defined in any of claims 1 to 7, for modifying a protein, a peptide or an amino acid comprising at least one thiol group.

10 17. Use of a compound of formula I as defined in any of claims 8 to 11, for glycosylating a protein, a peptide or an amino acid comprising at least one thiol group.

18. A method of chemically modifying a protein, peptide or amino acid comprising at least one thiol group, the method comprising converting said thiol group into a selenenylsulfide group.

15

19. A method according to claim 18, wherein the conversion is carried out by reacting the protein, peptide or amino acid comprising at least one thiol group with a compound of formula Xa or Xb:

20



wherein:

25 L^2 denotes a leaving group; and

R^2 denotes an optionally substituted alkyl group, an optionally substituted phenyl group, an optionally substituted benzyl group, an optionally substituted pyridyl group or an optionally substituted naphthyl group, or R^2 forms part of or is attached to a solid support.

30 20. A method according to claim 19, wherein R^2 is phenyl.

21. A method according to claim 19, wherein the compound of formula Xa or Xb is PhSeBr.

22. A method according to any one of claims 18 to 21, further comprising reacting the selenenylsulfide group in the protein, peptide or amino acid with an organic compound containing a thiol group.

5 23. A method of chemically modifying a protein, peptide or amino acid comprising at least one selenenylsulfide group, the method comprising reacting the protein, peptide or amino acid with an organic compound comprising a thiol group.

24. A method according to claim 22 or claim 23, wherein the organic compound
10 is a carbohydrate compound.

25. A method according to claim 22 or claim 23, wherein the organic compound is a protein, peptide or amino acid.

15 26. A protein, peptide or amino acid comprising at least one selenenylsulfide group, wherein the selenenylsulfide group is a group of formula:

-S-Se-R²,

20 wherein R² denotes an optionally substituted alkyl group, an optionally substituted phenyl group, an optionally substituted benzyl group, an optionally substituted pyridyl group or an optionally substituted naphthyl group.

25 28. A protein, peptide or amino acid comprising at least one selenenylsulfide group which is obtainable by the method of any one of claims 18 to 21.

29. A protein, peptide or amino acid comprising at least one disulfide bond which is obtainable by the method of any one of claims 22 to 25.

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